



X-Plain™ *Pacemaker*

Reference Summary

Introduction

A pacemaker is a device that regulates the heart beat. More than half a million Americans use a pacemaker.

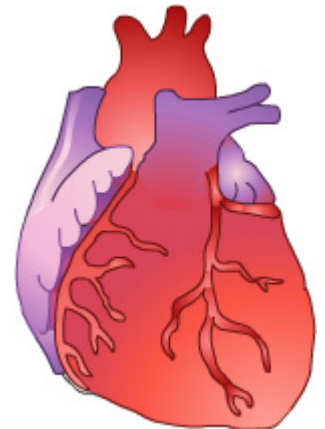
If your doctor recommends that you have a pacemaker, you will need to undergo surgery for it to be implanted.

This reference summary explains how pacemakers work, and the benefits and risks of having one. This program also discusses what to expect after getting a pacemaker.

The Heartbeat

The heart is the most important muscle in the body. It has a right and a left side. Each side has 2 chambers: an atrium and a ventricle.

Blood comes from the body to the right atrium. From there, it is pumped to the right ventricle. The right ventricle pumps the blood to the lungs. In the lungs, the blood is loaded with oxygen. From the lungs, the blood goes to the left atrium and then to the left ventricle. From there, it is pumped to the rest of the body and the cycle repeats. A normal heart rate varies between 60 and 100 beats per minute while a person is at rest.



The heartbeat starts when the heart receives an electrical signal. The electric current in the heart starts in an area of the right atrium called the sinus node. It causes the atria to contract and pump blood to the ventricles.

From the sinus node, the electric current travels through fibers that are similar to electric cables. Through the fibers, the electric current arrives in another area of the heart called the atrio-ventricular node, or AV node.

From the AV node, the electric current spreads to the ventricles and causes them to contract and pump blood.

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Each electrical signal results in one heartbeat. Any interruption to the normal flow of electrical signals in the heart results in an abnormal heart rhythm.

Arrhythmias

Any change in the normal rhythm of the heart is called an arrhythmia. Most arrhythmias result from problems in the electrical system of the heart.

Problems in the heart's electrical system can be caused by flaws in the sinus node, AV node, or any other part of the electric wiring of the heart.

Any of the following could lead to a problem in the electrical makeup of the heart:

- Heart attacks
- Valve problems
- Valve replacement surgery

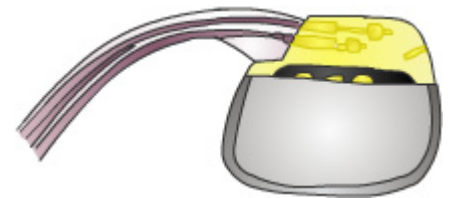
As long as the heart beats normally, blood flow to the body is not disrupted. Yet, when the heart beats too fast or too slow, blood flow to the body will usually decrease greatly. This can lead to dizziness, fainting, chest pain, and difficulty breathing.

Arrhythmias are usually treated with medication. When treatment does not work for the kind of arrhythmias that slow the heart down, a pacemaker may be necessary.

Pacemaker

A pacemaker is an electronic device that is surgically placed in the body to regulate the heartbeats. A pacemaker delivers extra electrical impulses to the heart to make it beat faster.

A pacemaker is an electronic device that is surgically placed in the body to regulate the heartbeats. A pacemaker consists of 2 components: a pulse generator and insulated leads. Some pacemakers have 1 lead and others have 2.



The pulse generator is a small metal box that contains a very small electronic chip and a battery. The battery provides the power and the electronic chip acts like a computer program. The electronic chip in a pulse generator senses the heart's beat and then sends out electric signals accordingly, in order to regulate heartbeats and maintain a normal rate.

The newest models of pulse generators weigh less than 1 ounce and are very thin. They have to be replaced when the battery dies, about every 6 years.

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The leads go from the pulse generator to the heart muscle through blood vessels.

They have 2 functions:

1. They sense how fast the heart is beating and send the information to the pulse generator.
2. According to information from the pulse generator, the leads transmit electrical signals to the heart to stimulate it to beat.

Before the Procedure

You will be asked not to eat or drink for several hours before the procedure. If your surgery is in the morning, this usually means no food or drink after midnight the night before.

Do not take any aspirin before surgery. Aspirin and similar drugs can increase bleeding during the procedure because they slow how fast blood can clot. If you are taking blood-thinning medications make sure to tell your doctor before the procedure. Ask him or her when you should stop taking the blood thinner and when you should resume taking it after the procedure.

Be sure to tell your doctor which medications you are taking **BEFORE** your scheduled procedure. Mention any over-the-counter medications and nutritional supplements you are taking. Also ask him or her which medications you should continue taking **AFTER** your discharge.

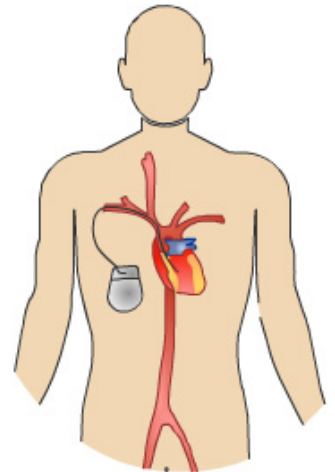
You will not be allowed to drive home after surgery. You must arrange to have somebody drive to and from the hospital or medical center where the procedure will be performed.

Procedure

Placing a pacemaker is a simple operation that is often done under local anesthesia. This means only the area of the incision is numbed; you will still be awake. Your doctor may also give you some medication to keep you relaxed.

Your upper chest will be cleaned and, if needed, the hair will also be clipped before the pacemaker operation.

First, the doctor makes a small incision in the upper chest, under the collarbone. This will be either on the right *or* the left side of your chest. The incision is about 2-3 inches long.



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Next, the doctor guides the leads of the pacemaker through a large vein all the way to the heart. To position the leads on the inner surface of the heart muscle, the doctor uses a special type of x-ray called fluoroscopy.

After taking an electrical measurement to make sure that the leads are in the correct spot, the doctor creates a small space under the skin to fit the pulse generator under the skin of the chest.

The leads are connected to the pulse generator and the pulse generator is placed in the special space or “pocket” under the skin. Finally, the doctor closes the incision and covers it with gauze to keep it clean. The whole procedure usually takes about 1 hour.

Risks & Complications

Implanting a pacemaker is a very safe operation. Risks and complications are very rare, but possible. Knowing about them may help you detect them early if they happen.

The following risks are common to any surgical procedure. However, they are very rare for pacemaker surgery.

- There is a risk of bleeding.
- There is a risk of infection. Infection may require replacing the pacemaker and taking antibiotics.
- A scar may develop, which may be painful or unsightly. The pulse generator may create a small bulge under the skin.

A risk that is specific to this procedure is the possibility that the pacemaker may fail. Due to technological advances, this risk is highly unlikely to happen, however, it is still possible. If it happens, the pacemaker would need to be replaced.

The leads or wires of the pacemaker may come loose or lose their connections with the heart. If this happens, another procedure may be needed to reposition the leads.

The heart or lungs may be injured during the procedure. This is very rare.

After the Procedure

Immediately after a pacemaker surgical procedure, a nurse will check your pulse, blood pressure, and heart rhythm. The doctor will tell you if you need to stay at the hospital and for how long. Sometimes it is possible to go home the same day that you have the pacemaker surgery, but most patients spend 1 day at the hospital after pacemaker surgery.

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The first day after pacemaker surgery, the incision area will be sore. Over-the-counter pain relief medications help to reduce minor pain. If you still feel pain, ask your doctor for a stronger pain medication. Women might want to place a pad over the incision to make a bra strap more comfortable until the soreness goes away.



The second day after pacemaker surgery, you will not need the bandage anymore, but your doctor may ask you to keep the incision site dry for up to 10 days. If your doctor allows a sponge bath, make sure to dry the incision site well after the bath.

You can resume most of your normal activities when you return home. Ask your doctor when you can go back to work. The length of time that you must stay home from work depends on your specific job and health condition.

Ask your doctor what types of stitches will be used and if you need to schedule a follow-up visit to remove any of them. Also ask which types of medication you should use. Your doctor may prescribe some antibiotics to prevent infection.

Call your doctor immediately if you notice any of the following signs, which may indicate infection:

1. Drainage at the incision site
2. Red or hot incision
3. Fever

For 4-6 weeks, avoid vigorous activities, such as playing tennis, golf, or baseball.

For 4-6 weeks, avoid lifting objects that are more than 10 pounds. This could cause the leads of the pacemaker to come loose.

iPods and possibly other similar devices have been found to affect pacemakers even when held at a distance of 18 inches. Some pacemakers worked erratically and others stopped working altogether in the presence of similar devices.

It is therefore extremely important for patients with pacemakers to stay away from such devices.

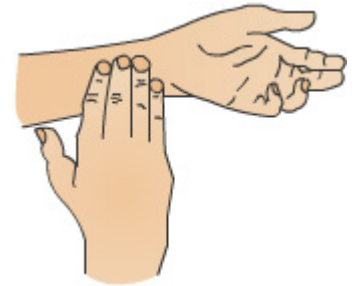
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Maintaining Your Pacemaker

Your nurse should check your pacemaker at least 2 times per year. He or she moves a special wand that looks like a computer mouse over the pacemaker.

The wand communicates with the pacemaker through radio signals. After checking the status of the battery, the pacing functions, and other settings, your healthcare provider can program your pacemaker using the wand. This makes the pacemaker as fine-tuned and specific to your medical needs as possible. Your doctor might give you a device that would allow you to have your pacemaker checked while at home. This is called trans-telephonic monitoring.

You can check your pulse and make sure it is at the correct rate. Ask your doctor what your minimum number of beats per minute should be.



Call your doctor if you notice that your heart is beating too slow or if you notice any symptoms, such as dizziness, blurred vision, or shortness of breath. When the pulse generator must be replaced, it is usually an outpatient procedure and the patient goes home the same day.

Living with a Pacemaker

After getting a pacemaker, any signs of dizziness, fainting, or shortness of breath should go away or become less frequent and serious. You will be able to resume all normal activities. However, you should not allow magnets near your pacemaker because they could disrupt the function of the pacemaker.

People with pacemakers should NEVER get an MRI or be near one, since MRI technology uses a very big magnet. MRI, or Magnetic Resonance Imaging, is a machine that allows doctors to look at structures inside the body. It uses a magnetic field instead of x-rays.

Power generating equipment and arc welders use powerful magnets and can affect pacemakers. Let your doctor know if you work in a setting where this kind of equipment is used.

You should also avoid any kind of heavy blow to the skin over the pacemaker. For example, if you hunt, fire the gun against the shoulder that does NOT have the pacemaker.

You may use any electrical device in your home, including microwave ovens. However, do not hold electrical devices, such as electric shavers, directly over your

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pacemaker! Patients with pacemakers can use a cellular phone. It is important to not put a cell phone that is turned on in a breast pocket above your pacemaker, though. If possible use the phone on the ear farthest away from your pacemaker.

Airport security devices do not harm pacemakers. The metal shell of the pacemaker should not set off the security alarm at airport security checkpoints. However, if this should happen, show your pacemaker ID card to the security guard; it shows the company that made your pacemaker.

Conclusion

Many abnormal heart rhythms can be treated with a pacemaker. A pacemaker generates electric pulses that regulate heartbeats. Thanks to advances in technology, pacemakers are very light and can adapt to your body needs from moment to moment, beating faster during exercise and slowing down at rest.

The procedure to insert a pacemaker is fairly simple and safe. Complications are rare, but knowing about them may help you to detect them early if they happen. After the procedure, you can go back to your regular activities after a short period of healing time.

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